tyco

Healthcare

KENDALL

novamedix

AV impulse system®

MODEL 6060

SERVICE MANUAL

Contents

1. WARRANTY DECLARATION .

2. MAINTENANCE 3

2.1 Introduction 3

2.2 Controller functionality tests 3

2.3 Computer based test method 4

2.4 Regular maintenance 4

2.5 Preventative maintenance 6

3. FAULT DIAGNOSIS 14

3.1 Power supply 14

3.2 Liquid crystal display 14

3.3 Compressor 15

3.4 Impulse control valves 15

3.5 Error codes 16

4. COMPONENT REPLACEMENT PROCEDURES 18

4.1 Opening and closing the controller case 18

4.2 Replacing an air hose socket 'O' ring seal 19

4.3 Replacing an air hose socket body 20

4.4 Replacing the membrane fascia label 20

4.5 Replacing the membrane switch panel 20

4.6 Replacing the compressor 22

4.7 Replacing the reservoir 23

4.8 Replacing a fill or vent valve piston 25

4.9 Replacing a valve coil 26

4.10 Replacing the fan assembly 26

4.11 Replacing the valve driver PCB assembly 28

4.12 Replacing the processor PCB assembly 28

4.13 Replacing display components 28

Contents

4.14 Replacing the EPROM 30

4.15 Replacing the power supply assembly . 31

416 Replacing the power cord . 32

4.17 Replacing the power inlet 32

4.18 Replacing a fuse holder 33

4.19 Replacing the power switch . . 34

5. UPGRADEITEMS 35

6. LIST OF SUPPORTING ITEMS 36

FIGURES....

Figure 1 View of the front of the controller 2

Figure 2 View of the rear of the controller and the bed hook / handle 2

Figure 3 Compressor user serviceable parts 11

Figure 4 View of opened case 19

Figure 5 View of the processor PCB assembly and liquid crystal display 21

Figure 6 View of compressor and valve driver PCB assembly showing the pneumatic and electrical connections 24

Figure 7 Diagram of valve driver PCB assembly showing pneumatic and electrical connections 27

Figure 8 Exploded view of both display assemblies 29

Figure 9 View of power supply assembly 31

Figure 10 Arrangement of wires on the power inlet 32

Figure 11 View of fuse holders and ground test screw 33

Figure 12 Arrangement of wires on the power switch 34

Figure 13 Electrical schematic 38

Figure 14 Pneumatic schematic 39

I. LIMITED WARRANTY AND FACTORY SERVICE

Kendall Healthcare Products Company hereafter called Kendall warrants that your A-V Impulse System® controller does not contain defective materials or workmanship. This warranty is for one year from the delivery of the controller to the original purchaser. If within the first year of purchase there is a fault on the unit, the controller should he returned to the Kendall Service Center at the address shown below. and Kendall will free of charge, inspect the unit and replace any part which upon their examination, appears to be defective provided that there is no evidence that the unit has been tampered with, or mistreated. This warranty does not apply to the air supply hoses or to the disposable ImPad® inflation pads or to equipment damaged through shipping, tampering, negligence, or misuse, including liquid immersion, autoclaving, or ETO sterilization.

If. within the first year of purchase the controller is serviced by personnel other than those expressly authorized by Kendall, the warranty becomes void. and the company cannot be held liable for any consequential damage caused as a result.

Some states do not allow the exclusion or limitation of accidental or consequential damages, so the foregoing limitation or exclusion regarding damages may not apply. Also. this Limited Warranty gives you specific legal rights. and you may also have other rights, which vary, from state to state.

This Service Manual is intended as a guide to technically qualified personnel when evaluating instrument malfunctions, it is not to be construed as authorization to perform warranty repairs. Unauthorized service will void the warranty.

The Kendall Healthcare Products Company maintains service facilities with the capability to promptly repair an A-V Impulse System® controller. Controllers requiring repairs must be shipped fully assembled, prepaid and insured to .

The Service Manager,
Building 2.
Kendall Healthcare Products Company,
5 Hampshire Street,
Mansfield, MA 02048.
Telephone: 1-800-421-8268.

If possible, the original packaging should be used to ensure safe arrival. Before shipping your unit please call the above number first to obtain a return materials authorization number.

If you have any service maintenance problems, contact the Service Manager at Kendall.

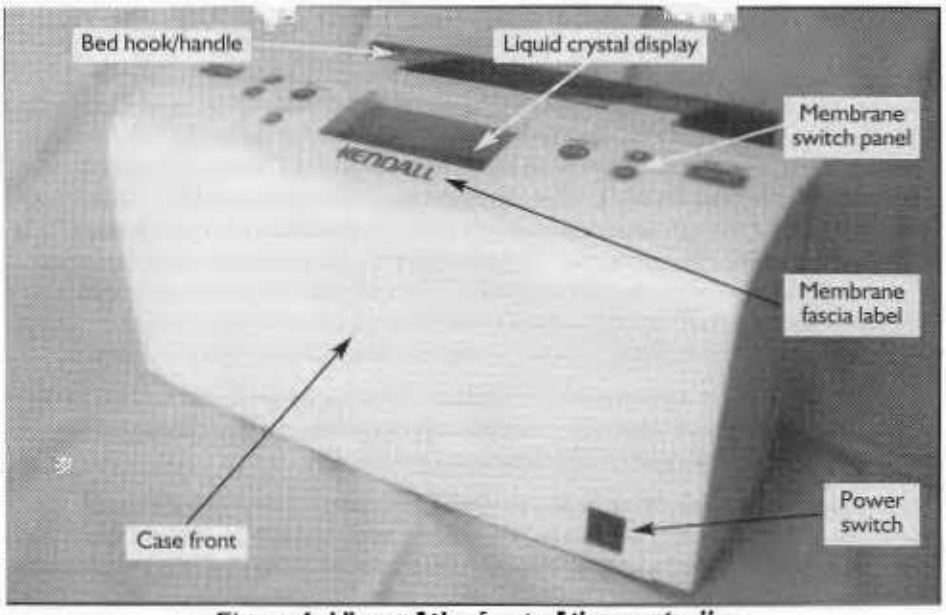

Figure 1: View of the front of the controller

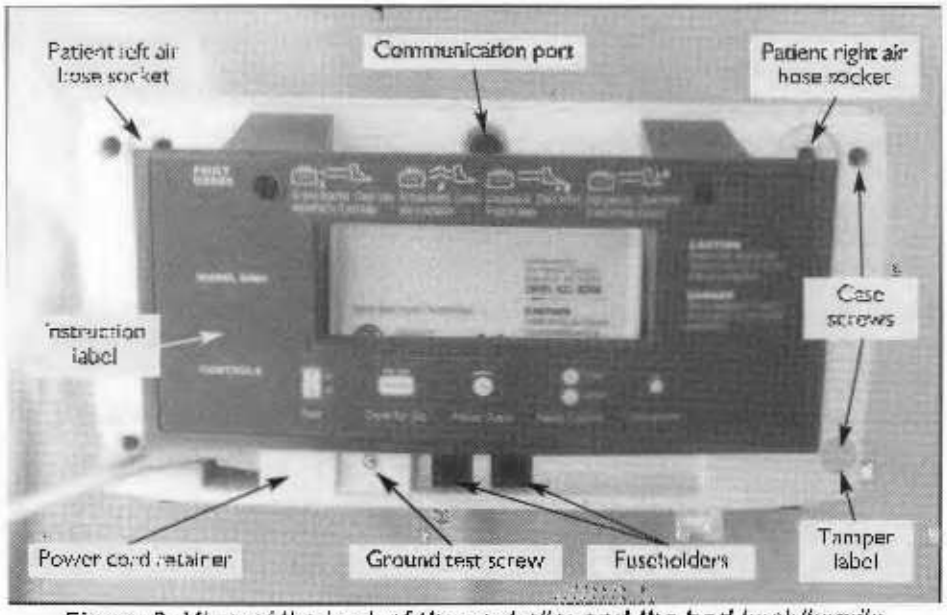

Figure 2: View of the back of the controller and the bed hook/handle

2. MAINTENANCE

2.1 INTRODUCTION

Personnel servicing this equipment should be familiar with the Operator's Instruction Manual and the operating principals of the A-V Impulse System® Controller. The alarm indicators displayed by the controller are useful in diagnosing problems. If a controller needs to be returned to Kendall for service, it should be accompanied by a description of the problem and any fault or error codes that are displayed along with a return materials authorization number.

This manual conforms with the Kendall policy of restricting service procedures to board level. In accordance with this policy circuit diagrams, repair and test information are not available for service personnel to attempt component level repair. Kendall maintains a stock of replacement boards if one is needed.

Throughout this manual user serviceable items are shown in italic type. The descriptions used are identical or abridged versions of items listed in Section 6.

THE CONTROLLER SHOULD ALWAYS BE DISCONNECTED FROM LINE VOLTAGE BEFORE ATTEMPTING ANY MAINTENANCE OR SERVICING PROCEDURE.

2.2 CONTROLLER FUNCTIONALITY TESTS

The functionality tests specified are the same as that used to verify correct operation of the controller prior to product release. Throughout this document reference is made t part or all of these tests to provide an effective means of verifying controller function.

2.2.1 Ensure that the controller is not connected to line voltage.
Release each *fuse holder* and confirm that the fuses are 1A and T speed rated. Replace the fuses and confirm that the fuse holder locks correctly.

2.2.2 Switch ON the controller and check that the start up routine and displays are clearly shown as described in the *Operator's Instruction Manual model 6060.*

2.2.3 Check that all of the backlight LEDs are illuminated.

2.2.4 Check that the compressor and fan are running.

2.2.5 Press the patient right and patient left PRESETS 1-2-3 buttons, and check that the pressure and impulse duration for each preset are correct.

2.2.6 Press the RUN. STOP Patient LEFT and the RUN. STOP Patient RIGHT buttons until the air hose and foot icons appear. The buttons should not need to be pressed more than twice.

2.2.7 Press the patient left and patient right '+' and '—'buttons twice each and check that the displayed pressure value changes.

2.2.8 Press the CYCLE button once. The cycle icon and cycle value should be displayed for five seconds.

2.2.9 Connect the *Standard test load (1 litre)* to the patient left and patient right channels. Check the pressure displayed is 130mm Hg and the hold time is 3 seconds. Press the RUN, STOP Patient LEFT and the RUN, STOP, Patient RIGHT buttons. Confirm that the check marks appear within 4 impulses on each channel.

2.2.10 With the cycle time set to 20 seconds, use a stopwatch to measure the time between impulses. The interval should be 20 seconds +/- 1 second.

2.2.11 Use an Electrical Safety Analyzer to check that the resistance of the power cord is less than 0.2 ohms. The analyzer test lead must be connected to the ground screw on the *power cord retainer*.

2.2.12 With the power switch in the ON position, use an Electrical Safety Analyzer to check that the leakage current is less than 0.1 mA. The analyzer test lead must be connected to the ground screw on the power cord retainer.

2.3 COMPUTER BASED TEST METHOD

The *Service Solutions CD-ROM* contains an audiovisual presentation illustrating service techniques and the extensive FrontLite® PC based test program suitable for inspection and preventative maintenance purposes.

This program is used to verify compressor output and impulse pressure using the *Standard test load (1 litre)* and controller cycle and inflation times through the controller communication port using the *controller to computer interface cable*. The controller can also be connected to a modem for remote interrogation through the communication port using the *controller to modem interface cable*.

2.4 REGULAR MAINTENANCE

The only regular maintenance necessary is to clean the outer case of the controller when required, and to check the *air supply hoses* and connectors for damage.

Remove external fluff from the fan inlet and outlet grills by gently vacuuming them and then remove fluff from the fan blades by blowing them with low-pressure air, without over-speeding the fan.

POSITION THE CONTROLLER TO REDUCE LINT ENTRY AND DO NOT COVER WITH BEDDING.

The controller case should be cleaned with a soft cloth dampened with water. If necessary the unit can be wiped with a mild disinfectant and/or detergent, but excess fluid should be avoided. The controller should be wiped dry with a clean cloth.

Caution:
Avoid the use of commercial cleaning solutions that contain Ammonium Chloride as the active ingredient. Such solutions are not compatible with the case materials.

NEVER IMMERSE THE CONTROLLER IN WATER, SPRAY LIQUID INTO THE CONTROLLER GRILLS OR STERILIZE BY ETO OR STEAM AUTOCLAVING AS IRREPARABLE DAMAGE WILL BE CAUSED.

2.5 PREVENTATIVE MAINTENANCE

To maintain optimum functional performance and electrical safety it is recommended that after one year's operation, and then every year, the controller be removed from use and checked.
Carry out all of the procedures contained in Sections 2.5.1 through 2.5.8 inclusive, referring to the recommended service schedule throughout.
When a controller is opened for service or repair, remove accumulated dust from inside the case halves, especially around the fan blades and fan housing area.

2.5.1 Labeling

Examine the labels on the controller and ensure they are legible and intact. If any of the information on a label cannot easily be read, the label should be replaced.

2.5.2 Power Cord

Examine the *power cord assembly* and replace the power cord if there are any signs of damage (see Section 4.16).
As a quick check use a digital ground tester, and check that the resistance between the ground pin on The power *cord*, and the *power cord retainer* screw is 0.2 ohms or less.
If this value is greater than 0.2 ohms, remove the power cord and test the power cord separately.
If the resistance of the power cord is greater than 0.1 ohms, then it should be replaced.
If the resistance of the power cord is less than 0.1 ohms, measure the resistance between the ground pin of the controller power *inlet*, and the ground test screw. If the value of this resistance is greater than 0.1 ohms, the controller should be returned to the Kendall Service Center for repair. Connect the controller, via the power cord, to an Electrical Safety Analyzer and confirm the ground resistance and leakage current (see Sections 2.2.11 and 2.2.12). If the test values exceed these limits the controller should he returned to the Kendall for repair.
Ensure that the power cord retainer screw is securely fastened for this test.

2.5.3 Cooling Fan

Check that the cooling fan is running smoothly and there is no vibration or other noise that might indicate the fan is damaged or obstructed. If the cooling fan is not operating at normal speed and efficiency, open the case to inspect it more closely. Beware of metal parts at higher than line voltage.
For greater access to the fan, the power supply assembly should be removed
(see Section 1.15).
Use a vacuum cleaner or low pressure air to remove dust or debris from the
cooling fan and grill.
Refit the power supply.

2.5.4 Membrane Switch Panel and Display

Switch ON the controller and check the *Liquid Crystal Display* (LCD) for sharpness, legibility and brightness. If the display appears dim or segments are missing, dismantle the display assembly and clean the contacts to the LCD (see Section 4.13). If after reassembling the controller the display is still defective, then replace the *zebra elastomer* and the *LCD bezel (snap fit)* only.

Use the following tests to check that the buttons on the *membrane switch panel* are working effectively. If a button has to be pressed hard or more than once in order to get a response, then replace the switch panel (see Section 4.5).

Press the RUN, STOP, Patient LEFT, and the RUN, STOP, Patient RIGHT buttons and check that the air hose and foot icons appear. Ensure the controller delivers an impulse to each channel. Stop the impulsing by pressing the RUN STOP buttons.

Use the PRESETS 1-2-3 button to select each setup in turn, and check that the information displayed matches the description in the *Operator's Instruction Manual*.

Use the "+" and "—" buttons to alter the impulse pressure.

Press the CYCLE button, then use the "+" and buttons to alter the cycle time.

2.5.5 Air Hose Sockets

Replace the *'O' ring seals* within the air hose sockets (see Section 4.2). Examine the *socket face* for damage such as chips and cracks. If there is any visible damage replace the socket (see Section 4.3).

2.5.6 Compressor

Service Interval
Compressors should be tested and maintained at 3000-hour intervals, except for compressors identifiable by a green dot on the air filter plate, which have a 6000-hour interval.

A *compressor service kit* is available containing all necessary parts to upgrade to a 6000-hour service interval.

Compressor Performance

PC test method
The compressor output pressure may be tested by using the *Service Solutions CD —ROM* FrontLite® test program and a PC connected through the controller communication port using the supplied cable and *Standard test load (1 litre)*, following the supplied instructions.

Manual test method
To manually test the compressor output pressure open the controller case front approximately one inch and carefully remove the 7 way flat flexible cable from the *processor PCB assembly*. Position the controller onto its handle, on a flat surface. Disconnect the compressor supply tube at the reservoir nipple and connect it to a pressure meter. Reinstate the controller to the upright position. Turn the controller power switch ON and read the pressure output.

Controller test method

For controllers with version 16 software the compressor output pressure can be tested directly on the controller using a Standard test load (1 litre) connected to the patient right channel.

Turn the controller power switch ON and during the 5 second countdown press the patient right ⌐button twice in quick succession to start the test. A 60-second countdown is displayed in the top left of the LCD and a flashing 'P' in the top right. When the countdown is complete the controller will impulse once from the patient right channel into the test load. The compressor output pressure is displayed in the top right of the LCD for 20 seconds, or until any button is pressed, after which the controller will revert to normal operation.

If the compressor output pressure is less than 16 psi then the compressor should he replaced with a new item, or removed from the controller and returned to the Kendall Service Center for a compressor exchange, alternatively the complete controller can be returned to Kendall for repair.

If required, the compressor may be serviced in-situ as follows.

Compressor Overhaul

Reference should be made to the Recommended Service Schedule table for guidance into compressor component replacement intervals.

The compressor specification is subject to a policy of continuous improvement and in accordance with this policy particular parts are available as upgrade items. This procedure is sequentially structured and assumes that latest upgrade parts are used throughout.

ENSURE THAT THE CONTROLLER IS NOT CONNECTED TO LINE VOLTAGE.

Air filter replacement

Undo the center screw at the top end of the compressor, and remove the plate. Lift out the *air filter element* and discard. Wipe clean the air filter recess and replace the air filter element. Apply one drop of Loctite 242 to the screw thread. Replace the plate and screw down securely.

Compressor disassembly

Without putting stress on the rubber mounting feet, unscrew the four screws securing the cylinder head using a Phillips #2 screwdriver. Carefully pull the cylinder head and front cover gasket away from the compressor body. Remove the *front cylinder housing*.

Loosen the screw holding the exhaust valve in place on the front cylinder housing, and rotate the valve to one side. Use an Isopropyl Alcohol (IPA) swab to carefully wipe the cylinder housing and the rubber seal in the exhaust valve. Align the rubber seal, metal valve, and over extension stop accurately over one another and 0.25mm from the edge. Tighten the screw and confirm their position.

OBSERVE HEALTH AND SAFETY PRECAUTIONS WHEN HANDLING CHEMICALS.

Remove the *piston assembly*, complete with *spring* and *spring seat*. Clean out the inside of the compressor body by blowing with compressed air.

If the piston can not be removed then the compressor may be out of alignment. The compressor should be replaced with a new item, or removed from the controller and returned to the Kendall Service Center for a compressor exchange, alternatively the complete controller can be returned to Kendall for repair.

Compressor disassembly if it is out of alignment
With access to a *compressor alignment tool* the compressor maybe realigned on site.

Remove the compressor from the controller (see Section 4.6).

Undo the two screws holding the rear cover to the compressor body and lift the cover off the wiring grommet.

Slacken the two screws holding the *rear cylinder housing* to the compressor body and carefully withdraw the piston assembly, complete with spring and spring seat.

Remove the two screws holding the rear cylinder housing to the compressor body, separate the parts and work the housing out from between the coils.

Inspect the *rear cylinder housing bearing insert* for wear. The insert must be hemispherical in shape. If the insert is worn, remove the old bearing and press in a replacement. If the rear bearing is serviceable wipe off all grease residue with an Isopropyl Alcohol (IPA) swab.

Remove the laminations and coils from the compressor body.

Compressor re-alignment
Clean off all residual adhesive from the rear cylinder housing, laminations and compressor body. Blow all compressor parts and the compressor body with low pressure compressed air.

Stand the compressor alignment tool upright on a flat surface, with the small diameter upward.

Place the compressor body over the alignment tool with the rear end uppermost and the feet toward you, ensuring that it locates correctly in the front cylinder housing recess.

Apply Loctite 454 (or 410) evenly around the lamination-mating surface of the compressor body. Apply Loctite 454 to the rear cylinder housing mating surface of the compressor body adjacent to the fixing screw holes.

Place the laminations and coils, with the wire grommet facing towards you, on top of the compressor body. With one hand keep the laminations elevated above the adhesive.

Position the rear cylinder housing with screws and washers between the coils and on the alignment tool. Insert and tighten the rear cylinder housing retaining screws.

Place the rear cover onto the upper surface of the laminations. Lower the laminations and rear cover onto the adhesive on the compressor body. Insert and tighten the rear cover retaining screws. Wipe off any excess adhesive.

Remove the alignment tool.

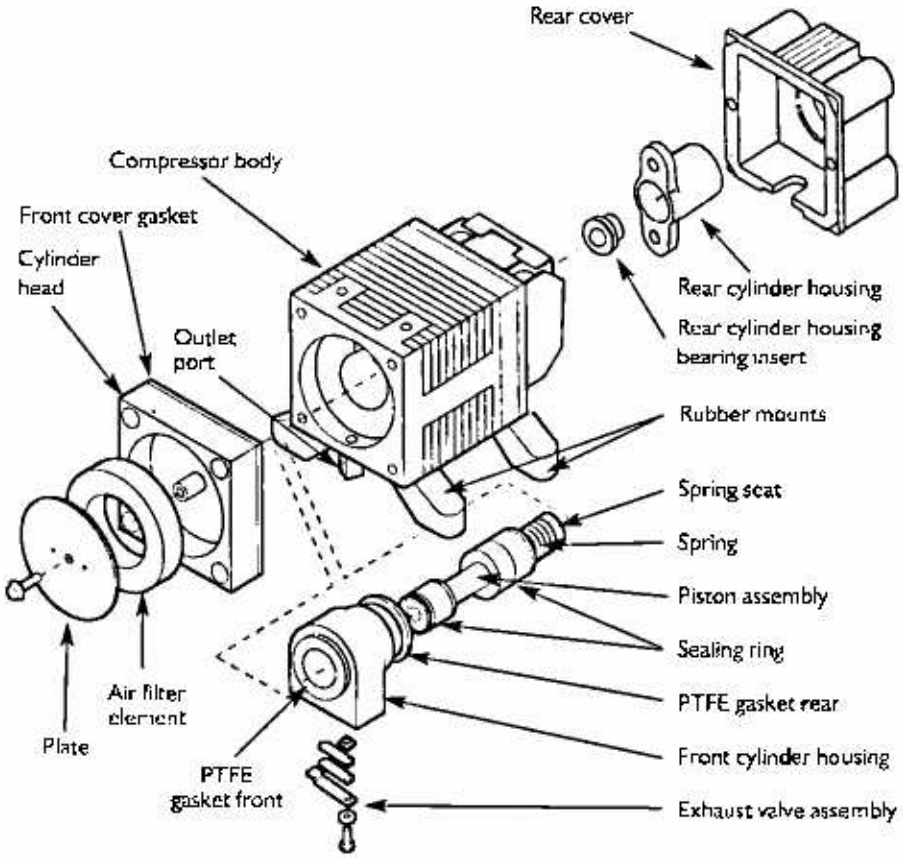

Figure 3: Compressor user serviceable parts.

Recommended Service Schedule

PART NUMBER	DESCRIPTION	SERVICE INTERVAL HOURS			
		3000	5-6000	8-9000	11-12000
	COMPRESSOR				
AV6534-00	Air filter element	M	M	M	M
AV6531-00	Piston assembly	M	M	M	M
AV6532-01	Front cylinder housing	U1	M U1	U1	M U1
AV6708-01	Rear cylinder housing	U2	M U2	U2	M U2
AV6710-00	Rear bearing insert	D	D	D	D
AV6533-00	Spring	M	M	M	M
AV6538-00	Spring seat	M	M	M	M
AV6709-01	Compressor lubricant	U3	U3	U3	U3
AV6536-00	PTFE gasket, front	D	D	D	D
AV6537-00	PTFE gasket, rear	D	D	D	D
AV6535-00	Front cover gasket	D	D	D	D
	COMPRESSOR Extended life				
AV6534-00	Air filter element	N	M	N	M
AV6531-00	Piston assembly	N	M	N	M
AV6532-01	Front cylinder housing	N	M	N	M
AV6708-01	Rear cylinder housing	N	M	N	M
AV6710-00	Rear bearing insert	N	D	N	D
AV6533-00	Spring	N	M	N	M
AV6538-00	Spring seat	N	M	N	M
AV6709-01	Compressor lubricant	N	M	N	M
AV6536-00	PTFE gasket, front	N	D	N	D
AV6537-00	PTFE gasket, rear	N	D	N	D
AV6535-00	Front cover gasket	N	D	N	D
	GENERAL PARTS				
AV6555-00	'O' ring seal	L	L	L	L
AV6540-00	Case foot set	A	A	A	A
AV6541-00	Case and handle grip set	A	A	A	A
AV6598-01	Tamper seal grey	M	M	M	M
AV6547-00	Reservoir assembly	U4	D	M	D
AV6564-16	EPROM	U5	U5	U5	U5
AV6517-02	Fan assembly	U6	N	D	N
	AIR HOSE				
AV6801-04	Connector inflation pad end	D	D	D	D
AV6802-02	Connector unit end	D	D	D	D
5007	Air hose blue	D	D	D	D

Key to Recommended Service Schedule

M	Mandatory Replacement
U1	Upgrade Possible: Replacement of Front cylinder housing AV6532-00 with AV6532-01 to extend compressor service interval to 6000-hours
U2	Upgrade Possible: Replacement of Rear cylinder housing AV6708-00 with AV6708-01 to extend compressor service interval to 6000-hours
U3	Upgrade Advised: Replacement of Compressor lubricant AV6709-00 with AV6709-01 for improved lubrication.
U4	Upgrade Possible: Replacement Reservoir. Please call the Kendall Service Center for details
US	Upgrade Possible: Replacement EPROM available for upgrade to the latest software version
U6	Upgrade Recommended: Replacement Fan AV6S 17-00, or —01 with AV6S 17-02 for improved durability.
D	Replace on discretionary basis
L	Lubricate with 0' ring lubricant AV6545-00
A	Replace using Loctite 401 after cleaning off all residual adhesive from molding.
N	No action

Compressor assembly

Fit a replacement spring and spring seat to the piston by twisting and pushing. Check that they are both secure.

Apply a 2-mm diameter sphere of *compressor lubricant* to the spring seat and insert the piston; spring first, into the compressor body.

Carefully place the front cylinder housing over the piston, locating the boss in the front cylinder housing recess and orientated to align the exhaust valve above the outlet port.

Check that the front cover gasket is undamaged and supple. If it is not, replace it. Fit the gasket over the pins on the underside of the cylinder head. Carefully place the cylinder head and the gasket onto the compressor body (with the serial number label uppermost), being careful to locate the pins in the cylinder head in their corresponding holes in the compressor body.

Insert the cylinder head screws into the holes and tighten them up evenly using a Phillips #2 screwdriver. DO NOT EXCEED 4.5lb/in (5.2kg/cm) TORQUE.

Apply the green dot to the air filter plate to identify the compressor has been fitted with upgrade parts.

WHEN CONNECTING TO THE POWER SUPPLY, BEWARE OF EXPOSED METAL PARTS AT HIGHER THAN LINE VOLTAGE.

Refit the compressor back into the controller.

Connect the controller to line voltage.

Test the compressor according to any method detailed in compressor performance at the start of this sub-section.

2.5.7 Alarms

Kinked air supply hose.

Connect the *Standard test load (1 litre)* to the patient right outlet. Switch ON the controller and press the RUN . STOP Patient RIGHT button, wait for the check mark to appear.

Kink the air supply hose to the test load. At the next impulse the controller will detect that the air hose is kinked, the air should be dumped immediately through the vent valve and the check mark will disappear.

After another three impulses the display should show the icon for a kinked air hose and a flashing fault code of 2, the audible alarm should sound and the controller should continue with short impulses. If the air is not dumped through the vent valve after the next cycle, then unkink the air hose and replace the *valve driver PCB assembly* see Section 4.11).

After the audible alarm sounds, unkink the air hose. At the next impulse the controller should detect that the kink has been removed, the audible alarm should stop and the icon for the kinked air hose should no longer be displayed. Allow the controller to continue impulsing until the check mark is displayed.

Repeat this test procedure for the patient left channel.

Detached air supply hose

Connect the Standard test load (1 litre) to the patient left outlet. Do not connect the patient right outlet. Switch ON the controller, press the RUN STOP Patient LEFT and the RUN. STOP Patient RIGHT buttons. After the first impulse to the patient right channel the controller should detect that the patient right air hose is detached. The display should show an arrow between the icon for the controller and the icon for the patient right air hose, and display a flashing fault code of 1. The audible alarm should sound, and the controller should continue to impulse to both channels.

Without stopping the impulses, disconnect the test load from the patient left channel and connect it to the patient right channel. Do not connect the patient left outlet. At the next impulse to the patient right channel, the controller should detect that an air hose has been connected, and the fault code for the patient right channel will no longer be displayed. After four impulses to the patient left channel, the display for this channel should show the icons for a detached air supply hose.

If the controller does not alarm correctly the controller should be returned to the Kendall Service Center.

2.5.8 Functionality and safety tests

Close the case.

Perform the controller safety tests to confirm the ground resistance and leakage current (see Sections 2.2.11 and 2.2.12).

Perform the complete controller functionality tests (see Section 2.2 or 2.3).

3. FAULT DIAGNOSIS

THE CONTROLLER SHOULD ALWAYS BE DISCONNECTED FROM LINE VOLTAGE BEFORE ATTEMPTING ANY MAINTENANCE OR SERVICING PROCEDURE.

Before undertaking any fault diagnosis, check the fuses. If, when the controller is switched ON, a replacement fuse blows immediately, the controller should he returned to the Kendall Service Center for repair.

The diagnostic procedures specified assume that the controller is connected to line voltage and switched ON. When diagnosing any fault. check the power supply output voltages first.

3.1 POWER SUPPLY

WHEN CHECKING THE POWER SUPPLY VOLTAGES, BEWARE OF EXPOSED METAL PARTS AT HIGHER THAN LINE VOLTAGE.

See the table below for the *power supply* assembly test points.

CONNECTOR/PIN (–)	CONNECTOR/PIN (+)	VOLTAGE (±5%)
PL3/1	PL3/2	+5V DC
PL3/1	PL3/3	+24V DC
PL4/1	PL4/2	+5V DC
PL4/1	PL4/3	+24V DC
PL5/1	PL5/3	<10V DC
PL5/1	PL5/3	120V AC see note (Line Voltage)

NOTE: Link PL4/4 to PL4/2 Via a 1K resistor. Disconnect the connector from the *valve driver PCB assembly* at PL3, and insert the legs of the resistor into the socket.
Use standard antistatic precautions when handling the electronic PCB's.

3.2 LIQUID CRYSTAL DISPLAY
(Including the LED backlighting and Liquid Crystal Display)

If the *Liquid Crystal Display* (LCD) is not backlit or only partially lit check the power supply output voltages.

Confirm the power supply voltages conform to the table (see Section 3.1).

If the voltages are correct then replace the *processor PCB assembly*. If the voltages are not correct then replace the *power supply assembly*.

If the LCD elements are Incomplete dismantle the display and clean the *zebra elastomer* and contact surfaces (see Section 4.13).

If the LCD is entirely blank check the power supply output voltages.

Confirm the power supply voltages conform to the table (see Section 3.1).

If the voltages are correct then check the fit of the EPROM into the socket. If this does not correct the fault, then replace the processor PCB assembly. If the voltages are not correct then replace the power supply assembly.

Alternatively the whole controller may be returned to the Kendall Service Center for repair.

3.3 COMPRESSOR

If the *compressor* is not operating check that the controller is not in the standby condition by pressing either the RUN. STOP Patient LEFT or the RUN. STOP Patient RIGHT buttons.

Confirm the power supply for the compressor is at line voltage.

If the line voltage is correct then remove the compressor from the controller and return it to the Kendall Service Center for a compressor exchange. If the line voltage is not correct then replace the *power supply assembly*.

Alternatively the whole controller maybe returned to the Kendall Service Center for repair.

3.4 IMPULSE CONTROL VALVES

If the controller is not impulsing air from either air hose socket, press both the RUN STOP Patient LEFT and the RUN . STOP Patient RIGHT buttons, check that the LCD shows that the controller is impulsing and listen for air issuing from the patient outlets. If air is not heard check the compressor performance (see Section 2.5.6).

Additionally the valve function can be checked by switching the controller OFF and ON, and listening for the sequence of multiple clicks as the valves are cycled during the start up routine.

If the clicks are not heard, check that the electrical connections to the *valve driver PCB assembly* and from the valve driver PCB to the *valve coils* are secure. If the valves still do not operate, disassemble the valves and clean them (see Section 4.8).

Alternatively the whole controller maybe returned to the Kendall Service Center for repair.

3.5 ERROR CODES

See the table below for controller error codes.

CODE	DESCRIPTION	CAUSE	REMEDY
E01	RAM error	Failure on processor PCB assembly	Replace the processor PCB assembly
E02	ADC error	ADC output is not zero at switch ON	Check that there is no pressure on the transducer at switch ON Replace the valve driver PCB assembly
E03	NVR error	Failure on processor PCB assembly	Replace the processor PCB assembly
E04	Membrane switch panel error	Buttons depressed at switch ON Defective membrane switch panel	Do not depress buttons at switch ON Replace defective membrane switch panel
E05	Left fill	Left fill valve not closing properly	Dismantle and clean valve components Replace the fill valve piston
E06	Left vent	Left vent valve not closing properly	Dismantle and clean valve components Replace the vent valve piston
E07	Right fill	Right fill valve not closing properly	Dismantle and clean valve components Replace the fill valve piston
E08	Right vent	Right vent valve not closing properly	Dismantle and clean valve components Replace the vent valve piston
E09	Hardware version	The software and hardware versions are not compatible	Check with the Kendall Service Center
E10	High pressure trip	The high pressure trip line is not zero	Check that there is no pressure on the transducer at switch ON Replace the valve driver PCB assembly
E11	NVR setup	A new software version has failed to update Non-Volatile RAM	Switch OFF and ON
E12	Over Temperature Cutout	Over Temperature Cutout exceeded 113°F (45°C)	Check the fan grills are not obstructed Check the fan is operating at normal speed and efficiency Replace the fan

4. COMPONENT REPLACEMENT PROCEDURES

THE CONTROLLER SHOULD ALWAYS BE DISCONNECTED FROM LINE VOLTAGE BEFORE OPENING THE CASE.

Before replacing any component, read the procedure completely.

If you have any doubts about how to replace a component, contact the Kendall Service Center.

Incorrect servicing could lead to components being damaged. If, after replacing a component, there are still problems that you cannot correct, contact the Kendall Service Center.

When you have replaced the part, and closed the case, you should always check that the fault has been corrected, and that the controller is operating properly by performing the complete controller functionality tests (see Section 2.2 or 2.3).

4.1 OPENING AND CLOSING THE CONTROLLER CASE

Opening up the case
Place the controller handle-side upon a flat surface, which will not scratch or otherwise mark the case. Use a 3mm hexagon Allen wrench to unscrew the four case retaining screws located at each corner. Turn the unit front-side up resting on the handle.

DO NOT try to separate the parts of the case at this stage. Ensure that the wires connecting the *power switch* to the controller electronics, and the 7 way flat flexible cable connecting the *membrane switch panel* to the processor PCB assembly, are not strained.

With the membrane switch panel facing you, very gently lift the top cover until the edge of the case front rests on the top edge of the bezel that surrounds the LCD. To the right side of the display you will see a flexible cable going into a small connector. Use a fingernail to gently open the latch on the connector. With your fingers pull the cable out of the connector. The case front can now be separated.

DO NOT allow the flexible cable to become creased or the cable will be damaged, and the membrane switch panel will have to be replaced. The wires connecting the power switch to the electronics are long enough to allow the two halves of the case to be laid beside each other.

Closing the case
With the display facing you, locate the bottom lip of the case front into the back of the *case rear molding* of the controller. Hold the *membrane switch panel* 7way flat flexible cable, and carefully lower the *case front molding* onto the case rear, making sure that the flexible cable comes over the front of the processor PCB. Avoid touching the contact end of the cable. DO NOT pull the flexible cable into a tight curve.

When the base of the case front is resting on the top edge of the LCD bezel, check that the latch on the connector for the control panel flexible cable is open. Hold the cable between the thumb and forefinger and carefully guide the cable into the connector, and then close the latch. Carefully close the case making sure there are no wires or tube, trapped, which will prevent the cue from being closed properly. Turn the controller over, and secure it with the four 3mm hexagon screws.

Perform the complete controller functionality tests (see Section 2.2 or 2.3). Fit a new tamper label over the case retaining screw (see Figure 2).

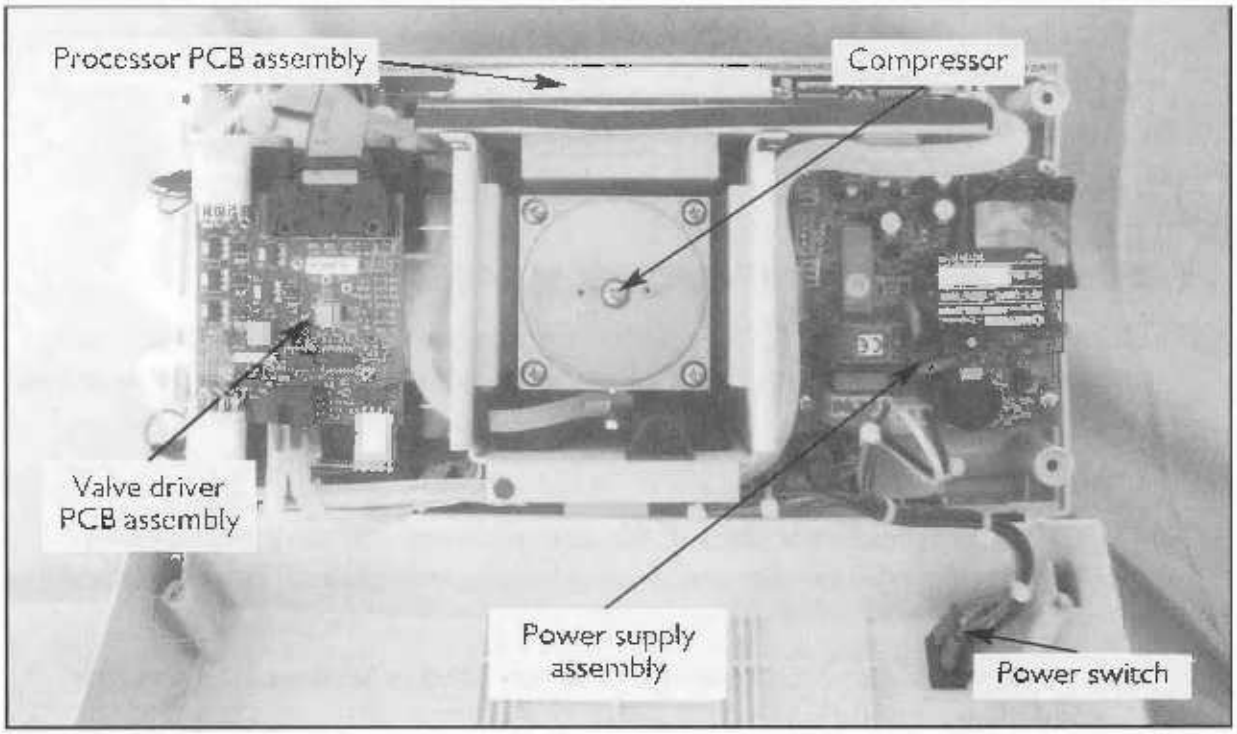

Figure 4: View of opened case.

4.2 REPLACING AN AIR HOSE SOCKET '0' RING SEAL

This is done without opening the case.

Use a quarter to unscrew the *socket face*.

Remove the old 'O' ring seal.

Lubricate the new 'O' ring by lightly covering the tip of your forefinger with 'O' ring lubricant and rolling the 'O' ring between this finger and your thumb.

The most reliable way to insert a new 'O' ring is to put the 'O' ring onto the plastic unit end connector. Put the connector and 'O' ring into the socket body, and turn the socket face into the socket body. This will guarantee the 'O' ring is seated correctly. When the 'O' ring is seated correctly, tighten the socket face with the quarter.

Perform the limited controller functionality test (see Section 2.2.9 or 2.3).

4.3 REPLACING AN AIR HOSE SOCKET BODY

Pull the tube off the *socket body*.

Use a screwdriver with a narrow (approximately, 3mm) flat blade to gently pry apart the gap in the case moulding which holds the socket in place, until it comes out.

Insert the new socket body in the correct orientation. The socket will only latch into place when the key with the catch on it is slid into the slot in the socket body. Fit an *'O' ring seal* and secure with the *socket face* (see Section 4.2).

Close the case.

Perform the complete controller functionality tests (see Section 2.2 or 2.3).

4.4 REPLACING THE MEMBRANE FASCIA LABEL

The *membrane fascia label (USA)* is adhesively mounted onto the case. Gently lift up one corner of the label and peel it off. Remove all adhesive reside from the *membrane switch panel*.

Remove completely the backing paper on the new fascia label.

Align the fascia label accurately with the case recess and smooth the label down, starting from the *LCD window* and always working away from it, ensuring that there are no air bubbles.

Perform the controller functionality tests as described in Sections 2.2.5 through 2.2.8 inclusive.

4.5 REPLACING THE MEMBRANE SWITCH PANEL (Including the LCD window and membrane fascia label)

Remove the *membrane fascia label (USA)* (see Section 4.4).

Use standard antistatic precautions when handling the *processor PCB assembly*.

With the *membrane switch panel* facing you, use a fingernail to gently open the latch on the membrane switch panel connector on the processor PCB assembly. With your fingers pull the 7 way flat flexible cable out of the connector. The case front can now be separated.

The membrane switch panel is adhesively mounted onto the case front. Gently lift up one corner of the label and peel it off.

Remove all adhesive reside from the case.

If the *LCD window* is not serviceable (i.e., scratched, chipped, or cracked), remove it.

Place the LCD window in the recess in the case front and secure it with a strip of clear adhesive tape along the lower edge.

Remove completely the backing paper on the new switch panel.

Hold the switch panel over the case front and thread the flexible cable through the rectangular hole. Before pressing down, make sure that the cut out is precisely lined up with the recessed edges of the LCD window.

Smooth the membrane switch panel down, starting from the LCD window and always working away from it, ensuring that there are no air bubbles.

Remove completely the backing paper on the new membrane fascia label (USA). Align the fascia label accurately with the case recess and smooth the label down, starting from the LCD window and always working away from it, ensuring that there are no air bubbles.

Close the case.

Perform the complete controller functionality tests (see Section 2.2 or 2.3).

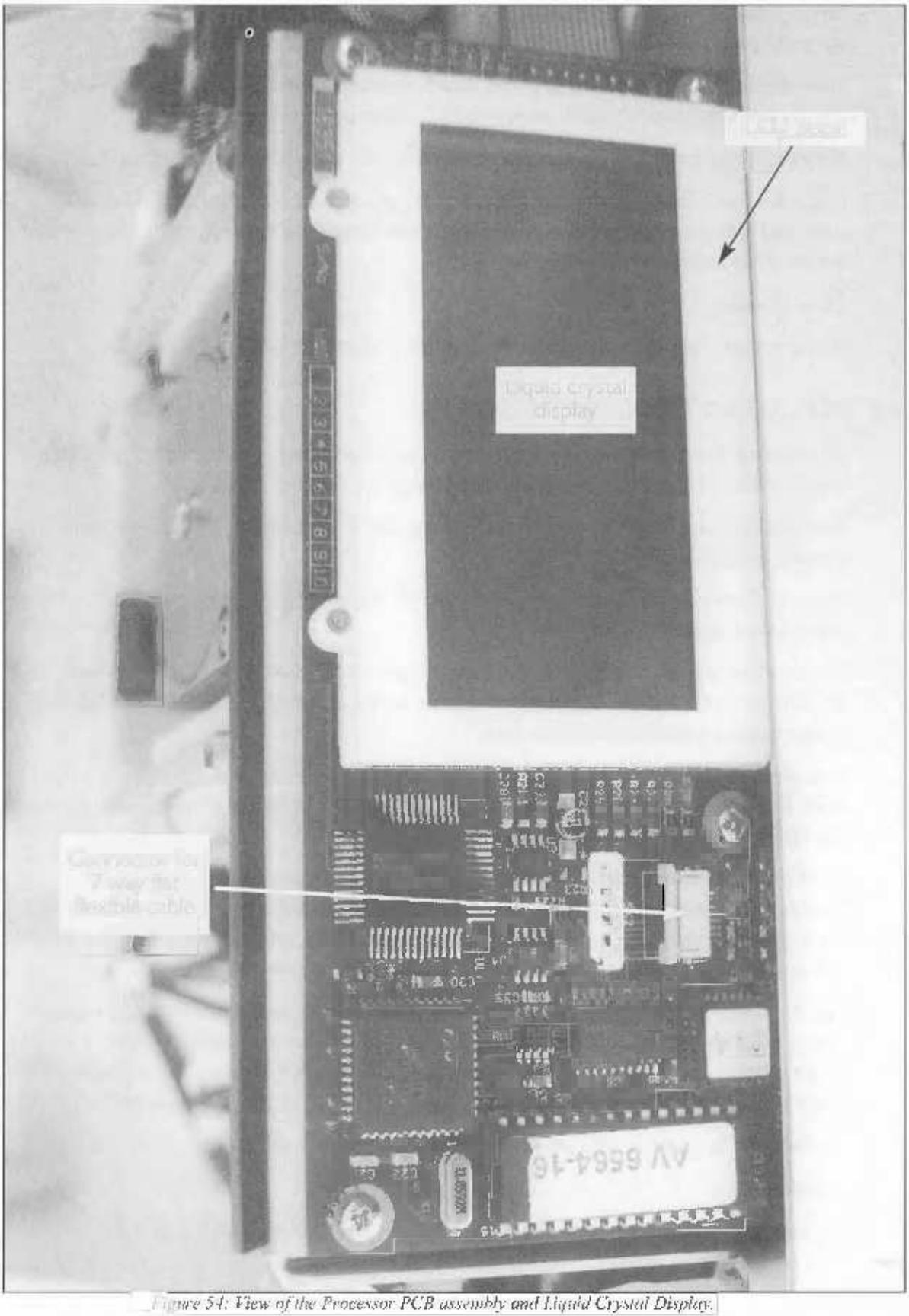

Figure 54: View of the Processor PCB assembly and Liquid Crystal Display.

4.6 REPLACING THE COMPRESSOR

Disconnect the *compressor* from the *power supply assembly* at PL5 (see Figure 13), and disconnect the compressor supply tube at the reservoir nipple.

Remove the large bore tube from the *tubing clips* on the side of the compressor chassis, and lift it clear.

Remove the *moisture drain assembly* from the clip on the underside of the compressor chassis.

Remove the screws, which hold the compressor chassis to the processor chassis, and the screws that hold the compressor chassis to the controller case. Tilt and lift the compressor assembly out of the case.

Remove the screws that hold the compressor to the chassis, and remove the tube from the compressor outlet. Remove the compressor from the chassis, taking care not to damage the *impact foam*.

Fit the compressor supply tube to the *compressor exchange* or new *compressor*. Position the compressor within the chassis, pass the connecting leads and tube through the grommets, and secure with the nuts, bolts, and washers. BE CAREFUL not to over tighten the nuts as this may damage the rubber mountings.

Put the compressor chassis assembly back into the controller case with the rubber mountings pointing toward the fuses. Secure the chassis to the case with four screws and washers, and secure to the processor chassis with two screws and washers. Connect the tube to the reservoir and connect the lead to the power supply.

Replace the large bore tube and the moisture drain into the tubing clips.

Close the case.

Perform the complete controller functionality tests (see Section 2.2 or 2.3).

4.7 REPLACING THE RESERVOIR

Use standard antistatic precaution. when handling the electronic PCB's.

Remove the old reservoir
Disconnect the 14 way ribbon cable from the processor PCB assembly to the *valve driver PCB assembly* at PL4 and the small 4 way connector from the power supply assembly at P1.3. (see Figures band 7).

Pull off the air supply tube from the *compressor* at the reservoir nipple.

Remove the three screws and washers holding the *reservoir* to the case.

Pull off the patient right air supply tube at the reservoir port.

Unclip the *moisture drain assembly* from the compressor chassis and pull off the tube at the reservoir nipple.

Lift up the reservoir and pull off the patient left air supply tube at the reservoir port. Remove the reservoir from the case.

Dismantle the old reservoir
Pull off the air tubes to the pressure transducer at the reservoir ports.

Disconnect both valve coil connectors from the valve driver PCB assembly at PL1 and PL2.

Remove the three screws and washers securing the valve driver PCB, and remove it. Remove the three rubber reservoir mounting bushes.

Remove the fill and vent valves from the old reservoir
Remove the four knurled nuts and rubber washers from the fill and vent valves and pull off the coils, noting the position of each valve coil.

Use a *tubular valve spanner* to undo the four valves. Be careful not to let the valve pistons fall out and take note of

the relative positions of the valves on the reservoir.

Remove each piston and blow out the inside of the valve stem with compressed air. With an Isopropyl Alcohol (IPA) swab, wipe the valve stems clean. Inspect the pistons for wear or damage and replace if necessary. Use the IPA swab to clean each piston.

Discard the old reservoir.

Replace the fill and vent valves onto the new reservoir
Fit the three rubber reservoir mounting bushes into the new reservoir.

Insert the fill valve pistons into the valve stems and replace the valve assemblies into the new reservoir (the end with a single reservoir mounting ring), and tighten. Insert the vent valve pistons into the valve stems, replace the valve assemblies into the remaining positions on the reservoir, and tighten.

DO NOT OVERTIGHTEN, AS THIS WILL DAMAGE THE VALVE STEM THREADS IN THE RESERVOIR MOLDING

Replace each valve coil in the correct position, with the recessed circular face at the threaded end of the valve stem. Fit a rubber washer and secure the coil with a knurled nut.

Rebuild the new reservoir
Connect the moisture drain assembly to the nipple on the end of the reservoir with two reservoir mounting rings.

Fasten the valve driver PCB using the three screws and washers, and refit the valve coil connectors (see Figure 6).

Connect the pressure transducer tubes to the small reservoir ports. With the pressure transducer ports nearest to you, the tube from the top of the transducer (P1) attaches to the small port on the patient right side of the reservoir (see Figure 6), and the tube from the lower transducer port (P2) attaches to the patient left side of the reservoir.

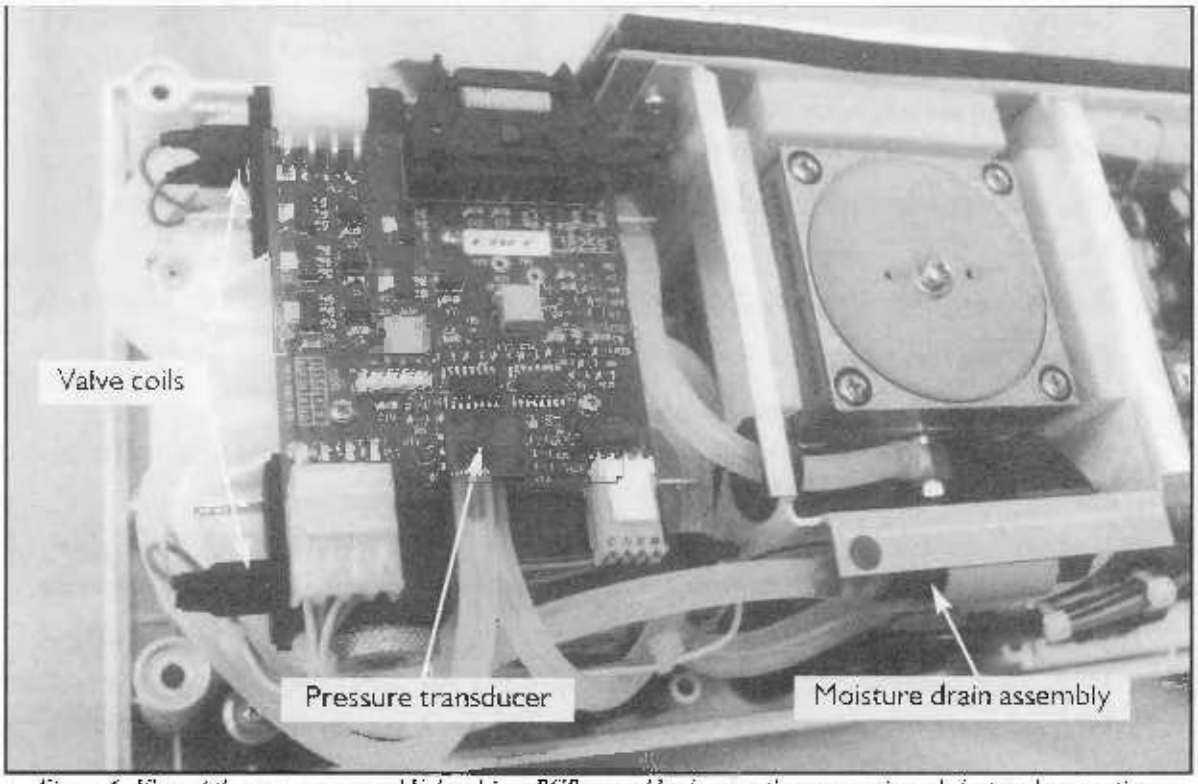

Figure 6: View of the compressor and Valve driver PCB assembly showing the pneumatic and electrical connections.

Install the new reservoir into the case.
Position the reservoir in its correct orientation in the case.

Connect the patient left air supply tube to the patient left air outlet port on the reservoir.

Press the rubber reservoir mounting bushes down over the plastic reservoir supports and secure with the three screws and washers.

Connect the patient right air supply tube to the patient right air outlet port on the reservoir.

Connect the air supply tube from the compressor to the nipple at the end of the reservoir with one mounting ring.

Refit the moisture drain into the *tubing clip* on the compressor chassis and push the tube onto the reservoir nipple.

Connect the ribbon cable from the processor PCB and the small 4-way connector from the power supply assembly to the valve driver PCB. Check that all tubes and wires have been connected correctly (see Figure 6).

Close the case.

Perform the complete controller functionality tests (see Section 2.2 or 2.3).

4.8 REPLACING A FILL OR VENT VALVE PISTON

Use standard antistatic precautions when handling the *valve driver PCB assembly*.

Remove the three screws and washers securing the valve driver PCB assembly, but do not disconnect anything from it.

To gain access to the patient left fill and vent valves, the *reservoir* will have to be partially removed.

Pull the patient right air supply tube from the reservoir, remove the *moisture drain assembly* from the *tubing clip* on the compressor chassis, remove the three screws and washers securing the reservoir to the case and gently lift it off the supports.

Remove the knurled nut and rubber washer on the faulty valve and pull off the *valve coil*. Use a *tubular valve spanner* to undo the valve stem. Be careful not to let the valve piston fall out.

Remove the piston and blow out the inside of the valve stem and molding with compressed air. With an Isopropyl Alcohol (IPA) swab, wipe the valve stem clean. Insert the new piston, replace the valve assembly into the reservoir, and tighten.

DO NOT OVERTIGHTEN, AS THIS WILL DAMAGE THE VALVE STEM THREADS IN THE RESERVOIR MOLDING

Replace the valve coil, with the recessed circular face at the threaded end. Fit the rubber washer and secure the coil with the knurled nut.

If the reservoir had to be partially removed, then replace it on its mountings, and secure it with the three screws and washers. Reconnect the air supply tube to the patient right air hose socket body and replace the moisture drain into the tubing clip on the compressor chassis.

Replace the valve driver PCB assembly onto the reservoir, and secure with the three screws and washers.

Close the case.

Perform the complete controller functionality tests (see Section 2.2 or 2.3).

4.9 REPLACING A VALVE COIL

Use standard antistatic precautions when handling the *valve driver PCB assembly*.

Remove the three retaining screws and washers from the valve driver PCB assembly, but do not disconnect anything.

Cut the heat shrink tubing off the connectors on the faulty coil and unsolder the leads. Remove the knurled nut and rubber washer and pull off the faulty valve coil. To replace the coil on the patient left valve, the *processor PCB assembly* will need to be removed.

Fit the new valve coil, with the recessed circular face at the threaded end. Fit the rubber washer and secure the coil with the knurled nut. Slide a half-inch length of *3/16"* diameter heat shrink tubing onto the connecting wires, and solder them to the coil, making sure of the correct wire orientation. Shrink on the pieces of heat shrink tubing.

Replace the valve driver PCB assembly onto the *reservoir*, and secure with the three screws and washers.

Close the case.

Perform the complete controller functionality tests (see Section 2.2 or 2.5).

4.10REPLACING THE FAN ASSEMBLY

Use standard antistatic precautions when handling the *power supply assembly*. The replacement fan *assembly* does not require an external RF filter PCB, as this function is incorporated internally.

Remove the patient left air supply tube from the *tubing clips*. Disconnect only the fan lead from the power supply assembly at PL3. Remove the four screws and washers securing the power supply assembly, and lift and rotate clear of the fan. Remove the four fan assembly retaining screws and washers and lift out the fan.

Use a vacuum cleaner or low-pressure air to remove any dust or debris from the fan mounting area.

Position the new fan over the fixings with the direction-of-air-flow arrow pointing towards the power supply, and the power lead pointing towards the *compressor*; secure the fan with the four screws and washers. Replace the power supply assembly and connect the lead from the fan. Refit the air supply tube back into the tubing clips.

Close the case.

Perform the complete controller functionality tests (see Section 2.2 or 2.3).

4.11 REPLACING THE VALVE DRIVER PCB ASSEMBLY

Use standard antistatic precautions when handling the *valve driver PCB assembly*.

Disconnect all electrical connectors from the valve driver PCB assembly, avoiding pulling them by the wires, and carefully pull off the air tubes from the pressure transducer ports. Remove the three mounting screws and washers, and lift off the *valve driver PCB assembly*.

Position the new valve driver PCB assembly on the *reservoir* and secure it with the retaining screws and washers. Connect all of the electrical connectors. Push the tubes from the reservoir onto the pressure transducer, with the tube nearest the *compressor* connected to the bottom port of the pressure transducer (see Figure 6).

Close the case.

Perform the complete controller functionality tests (see Section 2.2 or 2.3).

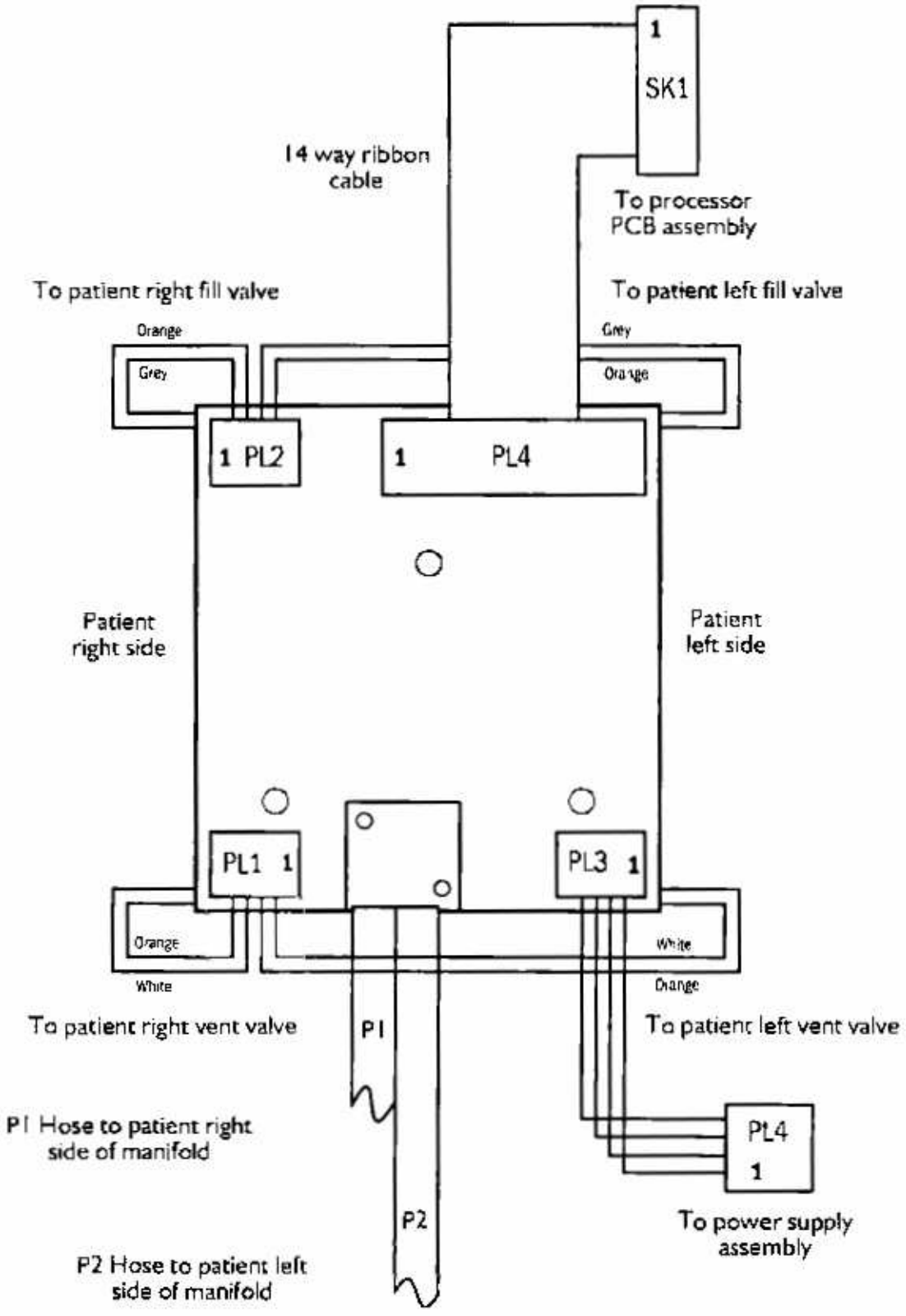

Figure 7: Diagram of Valve driver PCB assembly showing pneumatic and electrical connections.

4.12REPLACING THE PROCESSOR PCB ASSEMBLY

Use standard antistatic precautions when handling the *processor PCB assembly*. Remove the 14 way ribbon cable to the *valve driver PCB assembly*.

Remove the four processor PCB assembly retaining screws and washers, and carefully remove the PCB from the chassis.

Return the processor PCB assembly to the Kendall Service Center where, to maintain traceability, important data from the original processor will be programmed into the new processor before being dispatched.

Replace the processor PCB assembly onto the chassis, and secure with the four retaining screws and washers.

Connect the ribbon cable to the valve driver PCB assembly, and close the case.

Perform the complete controller functionality tests (see Section 2.2 or 2.3).

4.13REPLACING DISPLAY COMPONENTS

Use standard antistatic precautions when handling the *processor PCB assembly*. There are two types of LCD bezels: *LCD bezel (snap fit)* and *LCD bezel (screw fit)* and both are referred to (see Figure 8).

When servicing either bezel, disconnect the 14 way ribbon cable from the processor PCB assembly to the *valve driver PCB assembly*.

Remove the four-processor PCB retaining screws and washers, and carefully remove the POB from the chassis.

Place the PCB on the bench with the display facing downward.

Carefully unhook the bezel clips. Undo the four retaining screws from the PCB and remove the display components. (BE CAREFUL not to let the LCD fall out.)

With an Isopropyl Alcohol (IPA) swab, wipe the PCB contact area. Position the *backlight* over the LEDs, matching the holes in the panel with the guide pins in the PCB. Gently press the backlight over the guide pins, taking great care not to damage the LED's, as these are not user serviceable items.

With an IPA swab, wipe both black conductive edges of the *zebra elastomer* and insert the strip into the slot in the backlight.

With an IPA swab, wipe ONLY the contact edge of the LCD. Place the LCD with the contact edge onto the zebra elastomer.

Place the LCD bezel (snap fit / screw fit) over the display assembly, matching the clips / screw holes to the slots / holes in the PCB. Insert the elastomer side clips first (see Figure 8). Before inserting the other clips, check that the backlight is correctly located over the LED's. Then carefully press the other clips into the slots. Turn the processor PCB over and check that all the bezel clips have come through and are securely holding the bezel in place. If the bezel cannot be clipped in place, remove the complete display assembly, disassemble it, and start this procedure again.

For the screw fit bezel, locate the bezel over the LCD glass evenly and insert the four screws and washers. Tighten all screws equally.

If there is any resistance, do not use excessive force as this could damage the LED's or the LCD.

Replace the processor PCB onto the chassis, and secure with the four retaining screws and washers. Connect the ribbon cable to the valve driver PCB assembly.

Close the case.

Perform the complete controller functionality tests (see Section 2.2 or 2.3).

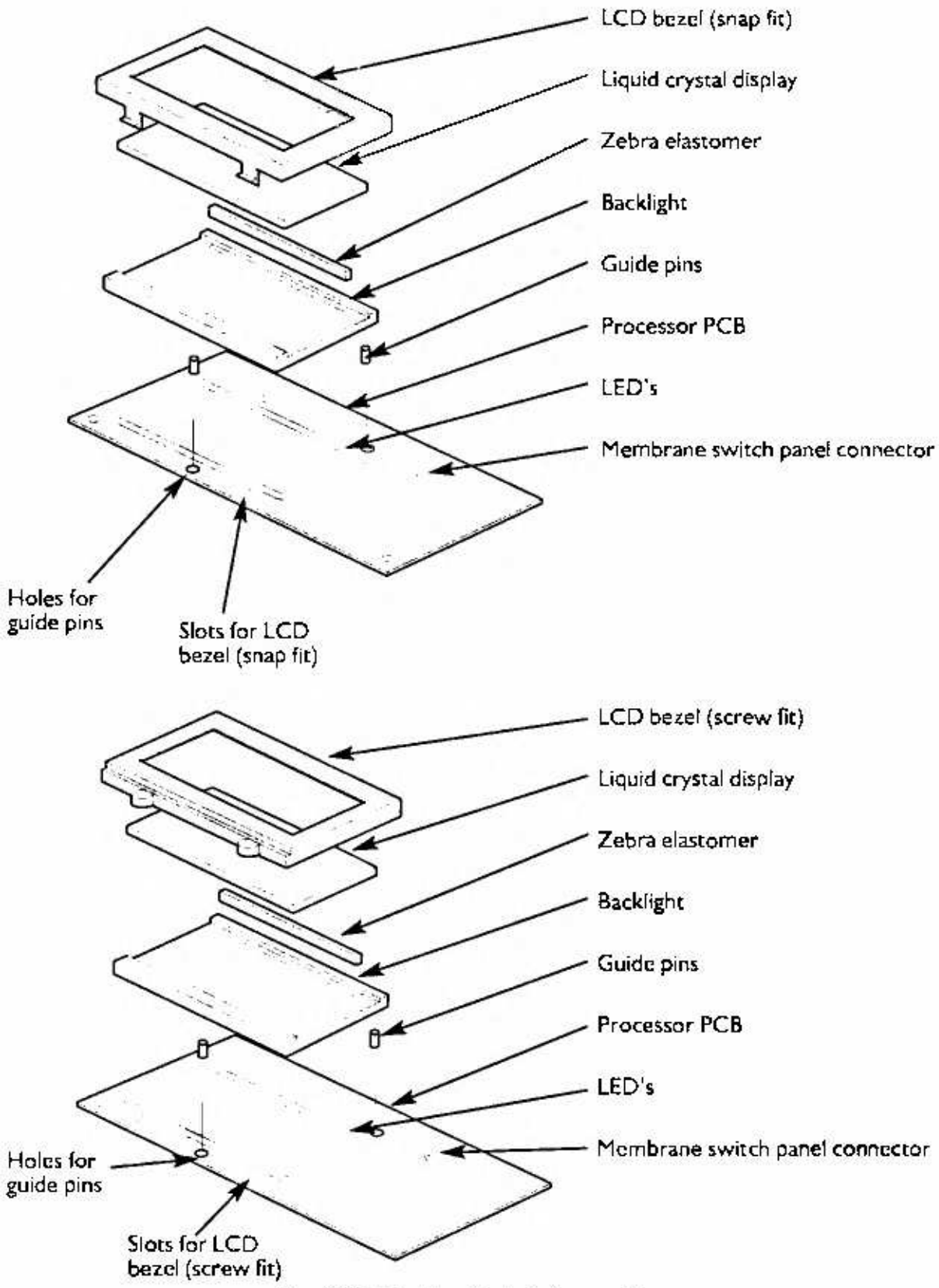

Figure 8: Exploded view of both display assemblies.

4.14 REPLACING THE EPROM

Use standard antistatic precautions when handling the *processor PCB assembly* or any of the components.

Use a screwdriver with a narrow (approximately, 2mm) flat blade inserted under the *EPROM* and to the right hand side of the crystal, and gently lever out the EPROM taking care not to damage the crystal.

With the EPROM out of the processor PCB assembly, remove all traces of the old adhesive on the processor PCB without damaging the PCB.

Check, and if necessary, form the leads of the new EPROM to match the spacing of the EPROM socket.

Squeeze a 1/4-inch length of non-corrosive silicon adhesive onto the processor PCB between the two rows of the EPROM socket.

Fit the new EPROM into the socket ensuring the correct orientation.

Close the case.

Switch ON the unit and confirm that both check marks shown on the LCD.

Perform the complete controller functionality tests (see Section 2.2 or 2.3).

4.15REPLACING THE POWER SUPPLY ASSEMBLY

Use standard antistatic precautions when handling the *power supply assembly*.

Disconnect all connectors from the power supply assembly. Avoid pulling the connectors by the wires. Remove the four screws from the power supply assembly and lift it off, avoiding the tube going to the air hose socket.

Locate the new power supply assembly over the supports, with its power input connector adjacent to the *power inlet*.

Secure the power supply assembly with four screws and washers and re-connect the leads. All the leads have unique connectors and can only be connected to the correct plugs. Make sure the connector is oriented correctly: keyed connectors have a tab and matching slot, latching connectors have hooks and clips.

Close the case.

Perform the controller safety tests to confirm the ground resistance and leakage current (see Sections 2.2.1 and 2.2.12).

Perform the complete controller functionality tests (see Section 2.2 or 2.3).

4.16REPLACING THE POWER CORD

This is done without opening the case.

Remove the *power cord retainer*, and remove the *power cord* from the *power inlet*. Insert the new power cord into the inlet socket, and secure with the power cord retainer.

Perform the controller safety tests to confirm the ground resistance and leakage current (see Sections 2.2.11 and 2.2.12).

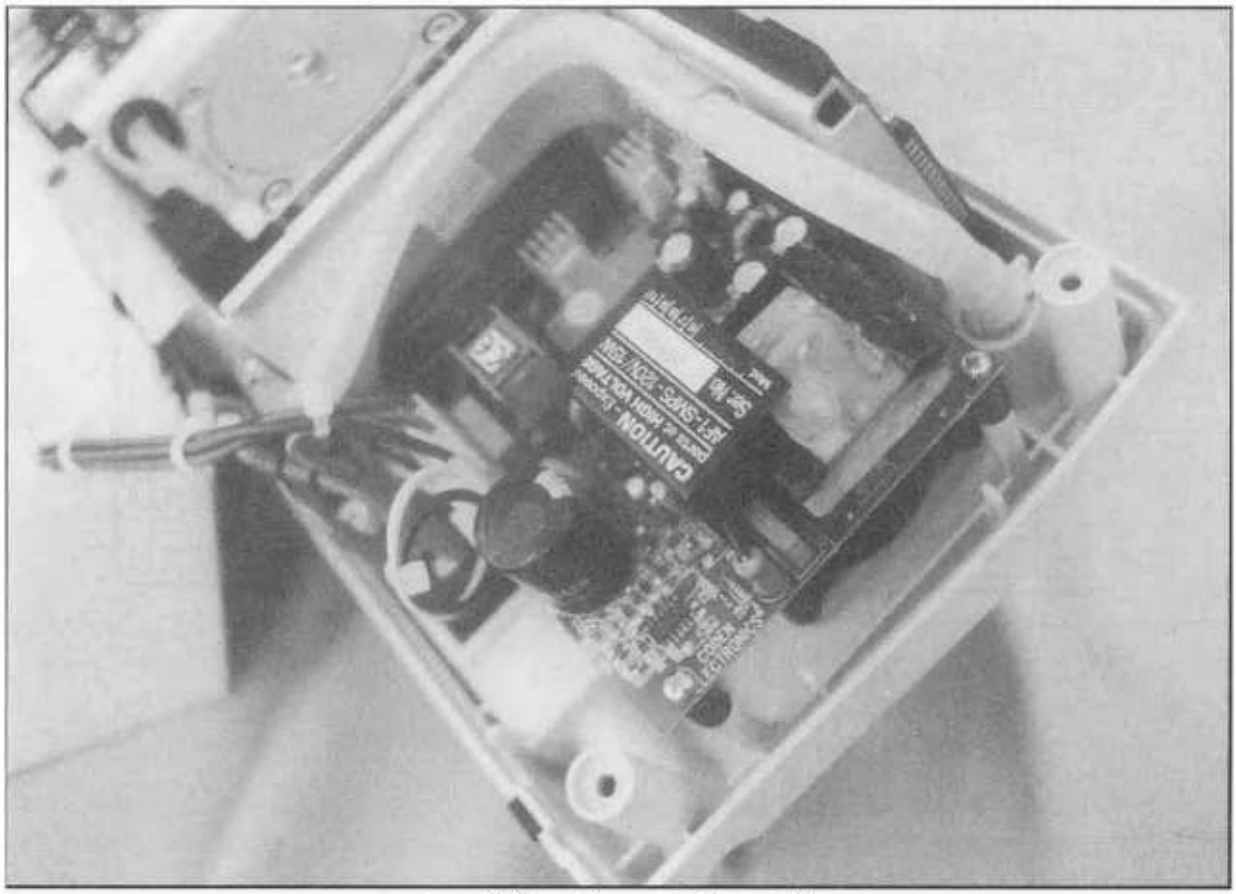

Figure 9: View of power supply assembly.

4.17 REPLACING THE POWER INLET

Remove the *power cord retainer* and remove the *power cord* from the *power inlet*. Pull off the three connectors from the rear of the inlet.

Use a screwdriver to collapse the retaining clips on each side of the inlet and push it through from the inside of the case.

Insert the new power inlet in the case, with the central ground terminal to the bottom of the case, making sure that it clips into place. The correct orientation is essential to allow the power cord to be inserted so that it can be secured by the power cord retainer.

Push the three connectors back on with the polarity as indicated by the markings on the rear of the socket (see Figure 10).

Insert the power cord into the socket, and secure with the power cord retainer, screw and washer.

Close the case.

Perform the controller safety tests to confirm the ground resistance and leakage current (see Sections 2.2.11 and 2.2.12).

Perform the complete controller functionality tests (see Section 2.2 or 2.3).

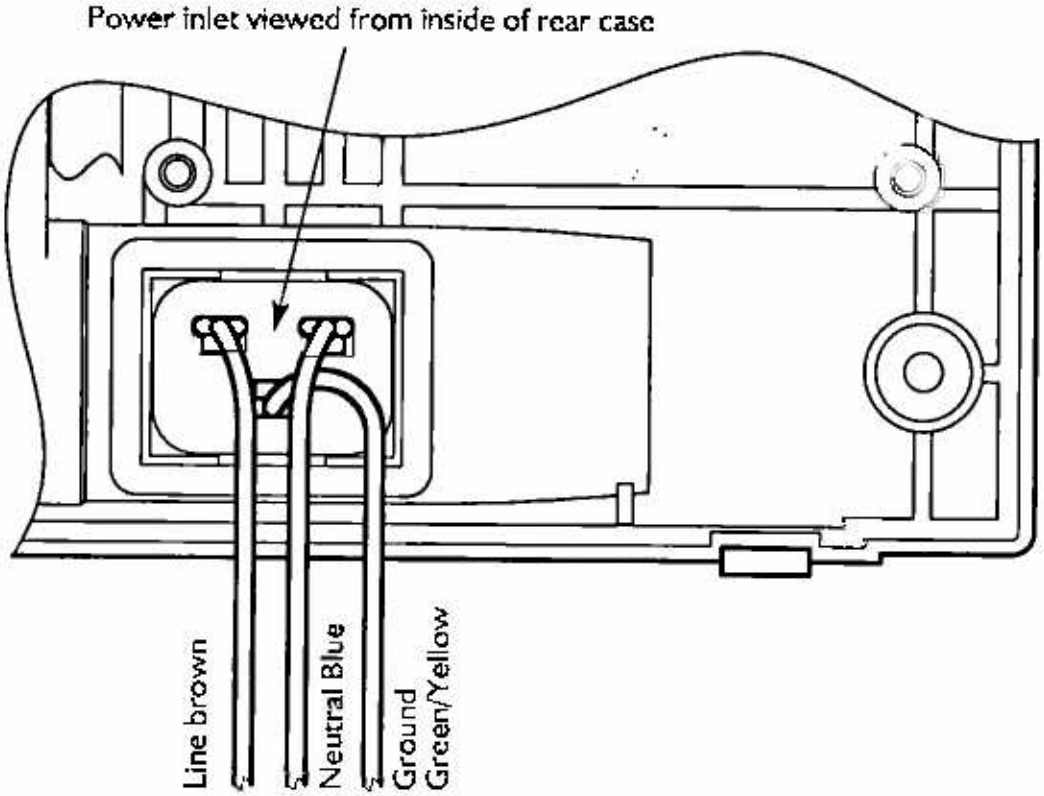

Figure 10: Arrangement of wires on the power inlet.

4.18 REPLACING A FUSEHOLDER

Remove the *fuse* from the holder.

Lift up the *insulation cover* around the contacts *of the fuse holder.*

Cut off the heat shrink tubing, unsolder the two connecting wires and pull them clear. Unscrew the plastic retaining nut on the stem of the fuse holder, and remove the fuse holder from the outside of the case.

Insert the new fuse holder and secure it with the plastic nut.

Slide a half-inch length *of 3/16"* diameter heat shrink tubing onto both wires, and solder them to the fuse holder, making sure of the correct wire orientation. Shrink on the pieces of heat shrink tubing

Replace the insulation cover, and replace the fuse.

Close the case.

Perform the controller safety tests to confirm the ground resistance and leakage current (see Sections 2.2.11 and 2.2.12).

Perform the complete controller functionality tests (see Section 2.2 or 2.3).

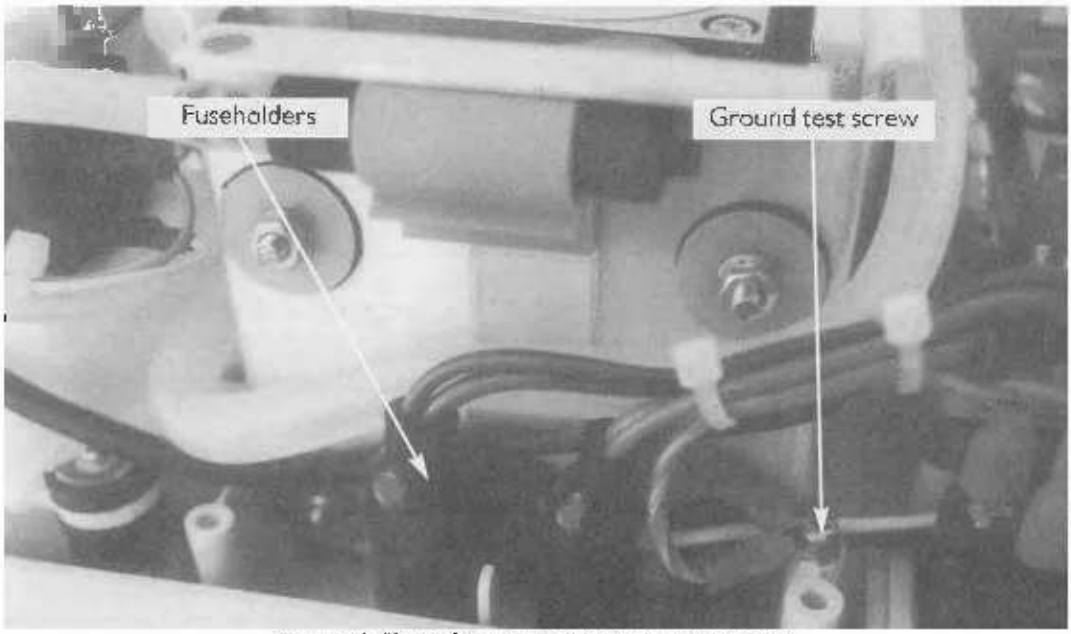

Figure 11: View of fuse holders and ground test screw.

4.19REPLACING THE POWER SWITCH

Pull off the four connectors, and push the *power switch* through from the inside of the case by using a screwdriver to collapse the retaining clips.

Push in the new switch from the outside of the case and re-fit the four connectors with the wires connected as previously (see Figure 12), and close the case

Perform the controller safety tests to confirm the ground resistance and leakage current (see Sections 2.2.11 and 2.2.12).

Perform the complete controller functionality tests (see Section 2.2 or 2.3).

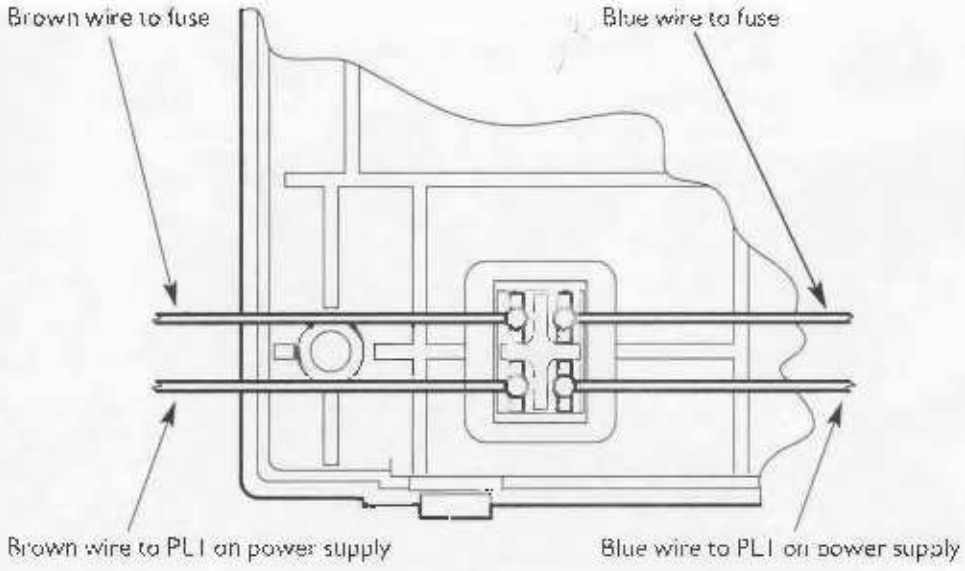

Figure 12: Arrangement of wires on the power switch.

5. UPGRADE ITEMS

The controller specification is subject to a policy of continuous improvement and in accordance with this policy particular items are available as retrofit upgrades for in-service controllers.

All upgrades are user installable by a competent person or can be implemented during a controller service.

Detailed information regarding any of these upgrade items or modification status can be obtained from the Kendall Service Center.

Compressor
The compressor is a user serviceable part with a recommended service interval.

For increased service life the compressor can be substituted or rebuilt using the latest extended life parts.

EPROM
The EPROM can he substituted to install the latest version software

This software includes refinements to the controller functionality, indication and test routines.

Fan
To extend durability it is recommended that a sleeve-bearing fan be upgraded to a ball bearing fan at the next service.

The fan type can be identified by reference to the fan label. The sleeve bearing fan is marked .. . . S2 and ball bearing fan is marked ....B2.

Fuse
To comply with the latest Technical Standards recommendations Fuse type T1A
250v is now superseded by High Breaking Capacity type T1AH 250v. Mark or change
Rating label when replacing with substitute fuse type.

Processor PCB assembly
The processor PCB assembly can be substituted to install the latest version hardware and software.

This includes the software upgrades provided by the EPROM and hardware to protect the controller from impaired cooling.

Reservoir
To mail' tam reliability the reservoir is a user serviceable part with a recommended service interval. Impaired cooling will reduce the service life of the reservoir.

The reservoir can be substituted to install the latest version incorporating internal structural revisions.

Valve driver PCB assembly
The valve driver PCB assembly can he substituted to install the latest version of hardware.

This benefits from improved pressure measurement stability.

6. LIST OF SUPPORTING ITEMS

Air supply hose	5007
Case and handle grip set	AV6541-01
Case foot set	AV6540-00
Case front molding assembly	AV6510-00
Case rear molding assembly	AV651 1-00
Compressor exchange extended life	RF6530-O1
Compressor extended life	AV6530-01
Compressor items	
air filter element	AV6534-00
compressor lubricant	AV6709-01
Compressor service kit	AV6751-00
front cover gasket	AV6535-00
front cylinder housing	AV6532-01
piston assembly	AV6531-00
PTFE gasket, front	AV6536-00
PTFE gasket, rear	AV6537-00
rear cylinder housing	AV6708-01
rear cylinder housing bearing insert	AV6710-00
spring	AV6533-00
spring seat	AV6538-00
Connector, inflation pad end	AVG8O1-04
Connector, inflation pad end lubricant	AV6546-00
Connector, unit end	AV6802-02
Connector, unit end, sterilizable	AV6803-01
Fan assembly	AV6517-02
Fill valve piston	AV6551-00
Fuse T1A, 250v	AV6514-00
FuseT1AH,250v	AV6514-01
Fuse holder	AV6515-0O
Handle assembly	AV6542-O0
Hanking tie, long	AV6829-00
Hanking tie, short	AV6809-00
Impact foam set	AV6526-00
Insulation cover	AV6715-00
Labels	
Brand label assembly (USA)	AV6594-02
Instruction label (USA)	AV6567-00
Membrane fascia label (USA)	AV6577-OI
Rating label (USA)	AV6583-00
Tamper label grey	AV6598-01
LCD window	AV6559-00
Membrane swtch panel	AV6580-O0
Moisture drain assembly	AV6548-0O
'0' ring lubricant	AV6545-O0
'0' ring seal	AV6555-00
Operator's Instruction Manual model 6060	AV6924-01
Power cord	AV6508-00
Power cord retainer	AV6512-00
Power inlet	AV6516-00
Power switch	AV6513-00
Printed circuit board items	
backlight	AV6556-00
EPROM programmed	AV6564-16
LCD bezel (screw fit)	AV6558-01
LCD bezel (snap fit)	AV6558-00
Liquid Crystal Display	AV6557-00
PCB upgrade kit	AV6750-32
Power supply assembly, 120v	AV6520-00
Processor PCB assembly V3	AV6563-02
Valve driver PCB assembly V2	AV6562-01

zebra elastomer	AV6560-00
PVC cap, black, large	AV6808-00
PVC cap, black, small	AV6807-00
Reservoir assembly	AV6547-00
Screw set	AV6525-00
Service Manual model 6060	AV6925-01
Socket body	AV6554-00
Socket face	AV6553-00
Tools	
A-V Impulse System toolkit 1	AV921-00
A-V Impulse System toolkit 2	AV921-01
Compressor alignment tool	AV922-01
Controller to computer interface cable	AV916-00
Controller to modem interface cable	AV917-01
Service Solutions CD-ROM	FLKT1-00
Standard test load (1 litre)	AV918-00
Tubular valve spanner	AV923-00
Tubing clip	AV6707-00
Valve coil	AV6550-00
Vent valve piston	AV6552-00

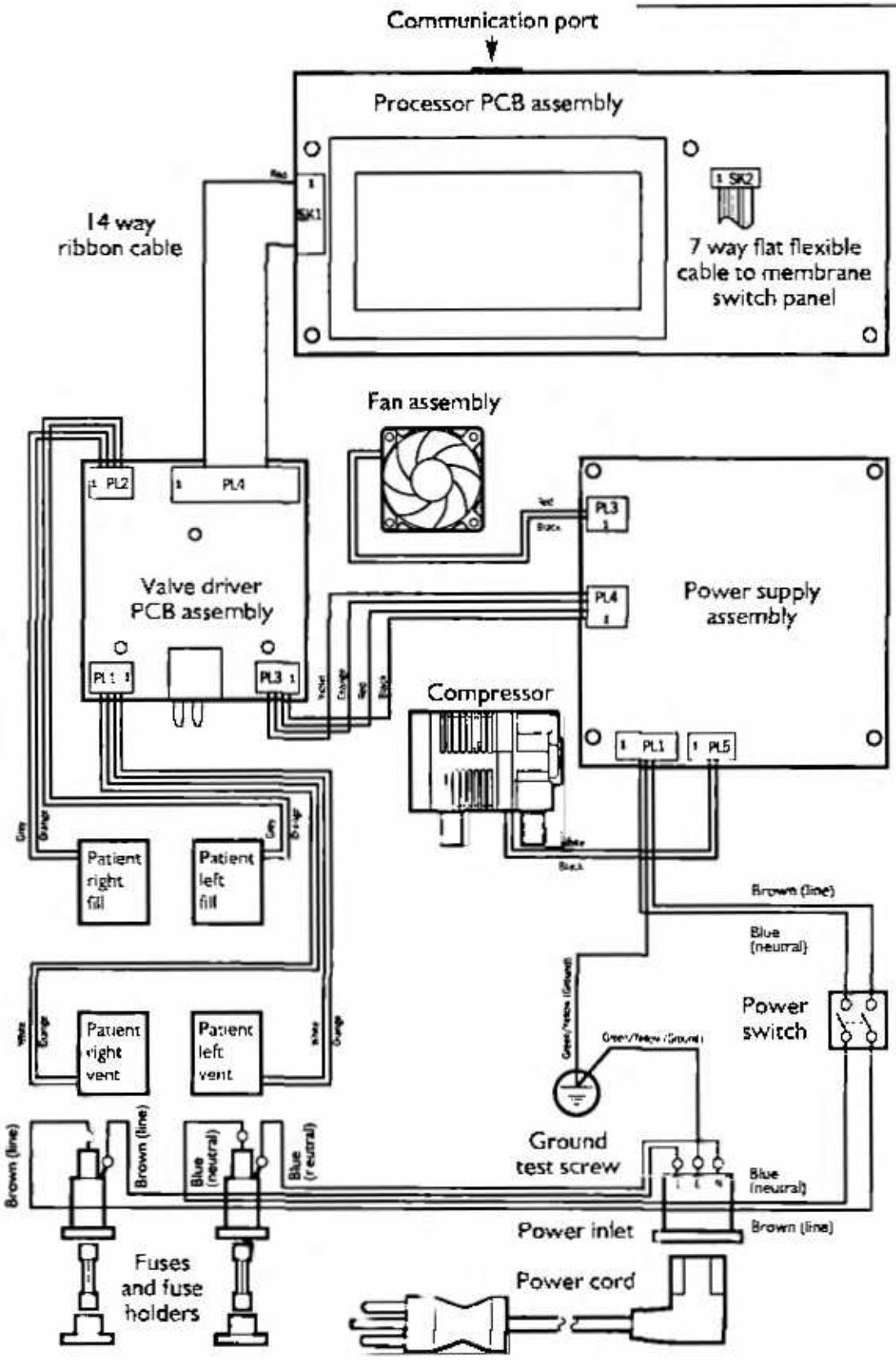

Figure 13: Electrical schematic.

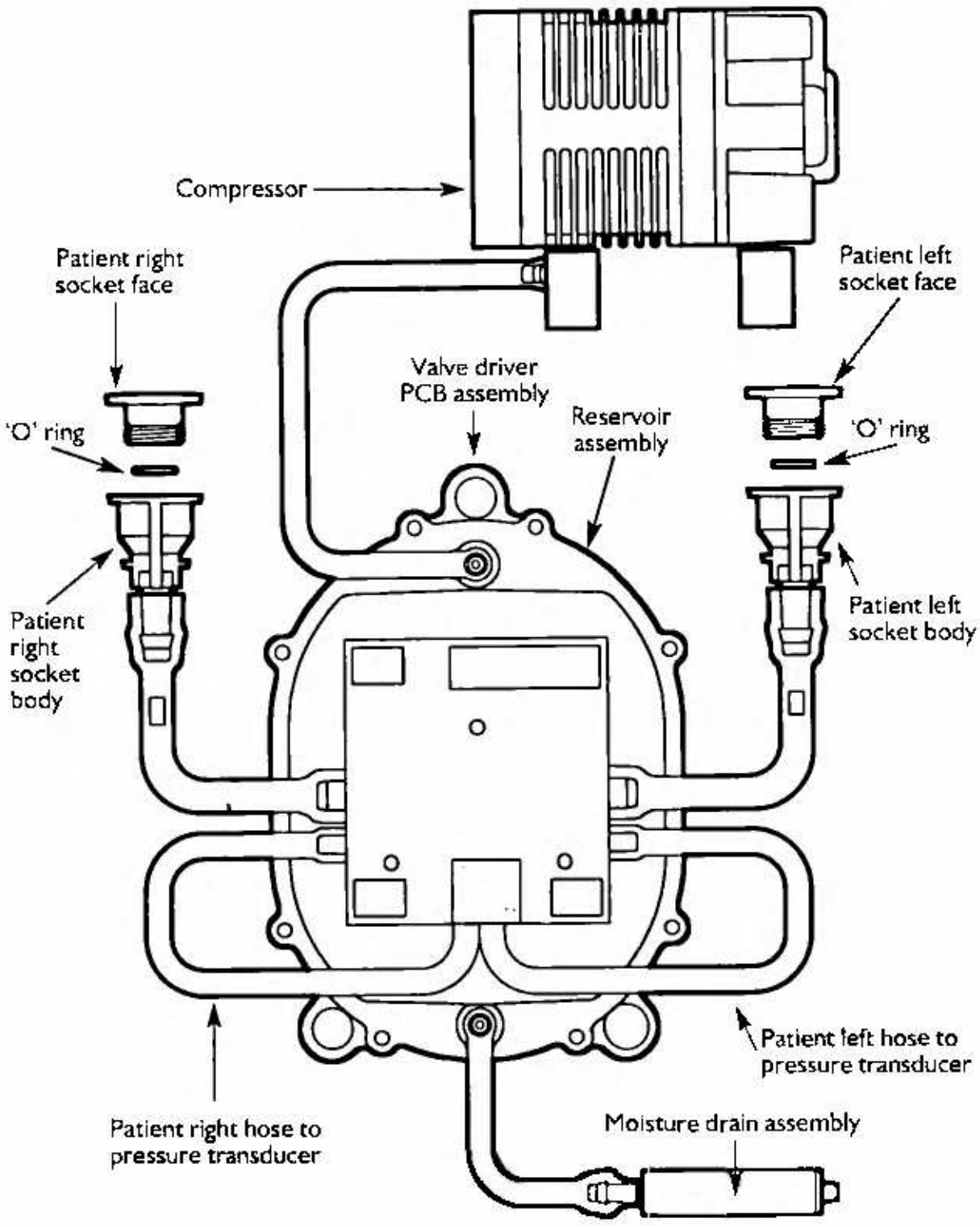

Figure 14: Pneumatic schematic.

US/6060/USA

Update notes

Distributed by: tyco Healthcare

KENDALL

Mansfield MA 02048
Kendall Customer Service 1-800-421-8268

Novamedix, A-V Impulse System and ImPad are Registered Trademarks of Novamedix Distribution Limited.
Kendall and T.E.D. are Registered Trademarks of The Kendall Company. Webril is a Trademark of Veratec, Inc.
Made in England under one or more of the following Patents: U.S. Patent Numbers:
Re. 32,939 Re.32,940 4,696,289 4,721,101 4,809,684 4,846,160 5,997,495 © Novamedix 2000. All rights reserved.
In line with its policy of continuing product improvement, the Company maintains the right to change specifications without notice.

FEDERAL LAW RESTRICTS THIS DEVICE TO SALE
BY OR ON THE ORDER OF A PHYSICIAN

0004914) 19/OCT/2004